
BILATERAL BLINDNESS DUE TO TRAUMA IN CAMBODIA

HEATHER JACKSON

London

SUMMARY

Ocular trauma is a major cause of monocular blindness in both the developed and developing world, but is not seen as a significant cause of bilateral blindness. Trauma is therefore generally thought of as a major cause of blind eyes without being a major cause of blind people. Because of the difficulties of surgical treatment of ocular trauma in many developing countries, long-term management is usually aimed at prevention, e.g. by improving safety standards in the workplace. The situation in countries such as Cambodia, which have high landmine densities, is different. Cambodia has an estimated 4–10 million landmines which cause significant morbidity and mortality. This hospital-based study of blindness in the north-west of Cambodia found that of 453 bilaterally blind individuals, 17 (4%) were blind as a result of trauma, and 14 of these were males 15–35 years old. Fourteen cases were due to bilateral penetrating injuries caused by landmine explosions, and usually occurred in association with other severe injury. The other main causes of blindness were cataract (59%), glaucoma (14%) and corneal scarring (12%). Penetrating ocular trauma is a significant cause of bilateral blindness in Cambodia, and predominantly affects young men. It is estimated that it would take 250 years to clear Cambodia of landmines at current activity levels.

Few reliable data on the prevalence of blindness from ocular injury in developing countries are available. Previous population-based surveys^{1,2} and surveys of schools for the blind^{3,4} in developing countries have not reported ocular trauma as being a significant cause of blindness, although it is regarded as being one of the major causes of monocular blindness, especially in children.^{5,6} The relative rarity of these injuries and the high degree of technology needed for appropriate surgical treatment, often not available in developing countries, mean that efforts

to reduce the incidence of severe ocular trauma are usually directed towards prevention, for instance by education and promoting safety in the workplace.⁵

The incidence of severe ocular injury leading to bilateral blindness in countries with high landmine densities, such as Cambodia, appears to be much higher. Cambodia has an estimated 4–10 million landmines which cause significant morbidity and mortality to its population of 8.8 million, resulting in the highest percentage of amputees in the world.⁷

PATIENTS AND METHODS

In a hospital-based study of blindness in Battambang Province in the north-west of Cambodia, all blind individuals (visual acuity of less than 3/60 in the better eye) attending the eye clinic at the provincial hospital between January and September 1994 were identified. All patients had their visual acuity assessed using a Snellen E chart, and were examined using slit lamp biomicroscopy and indirect ophthalmoscopy. A careful history was taken. Cases of unilateral blindness due to trauma and cases where the visual acuity improved to >3/60 in the better eye after medical and surgical treatment of trauma are not reported here.

RESULTS

Four hundred and fifty-three bilaterally blind adults were identified. Seventeen (4%) were blind as a result of bilateral trauma, and 14 of these were males aged 15–35 years (Table I). One patient, a 33-year-old man, had been assaulted with a corrosive chemical some years earlier. Two patients, a man aged 55 years and a woman aged 67 years, had old bilateral penetrating injuries of which the exact causes were impossible to ascertain other than that they occurred during 'the Pol Pot time' (1975–9). The other 14 cases were due to bilateral penetrating injuries caused by landmine explosions, and these frequently occurred in association with other severe injury (Fig. 1). Only one patient admitted to being on

Correspondence to: Miss H. Jackson, Department of Ophthalmology, King's College Hospital, Denmark Hill, London SE5, UK.

Table I. Bilateral blindness due to trauma

Sex	Age (years)	Visual acuity		Cause
		Right	Left	
M	33	NPL	PL	Chemical injury
M	32	CF	PL	Landmine
F	67	HM	HM	Old penetrating trauma (? cause)
M	55	NPL	NPL	Old penetrating trauma (? cause)
M	28	HM	NPL	Landmine
M	30	HM	NPL	Landmine
M	23	CF	NPL	Landmine
M	30	NPL	PL	Landmine
M	20	HM	NPL	Landmine
M	20	CF	NPL	Landmine (+ old corneal scar RE)
M	22	HM	NPL	Landmine
M	25	HM	NPL	Landmine
M	28	NPL	HM	Landmine (+ old catapult injury RE)
M	29	CF	CF	Landmine
M	34	NPL	PL	Landmine
M	57	NPL	PL	Landmine
M	34	NPL	PL	Landmine

CF, counting fingers; HM, hand movements; PL, perception of light; NPL, no perception of light; RE, right eye.

active military service at the time of the injury; all others were engaged in activities such as woodcutting and farming. The exact cause of eventual blindness was difficult to ascertain in most cases due to phthisis bulbi. No cases identifiable on history or examination as sympathetic ophthalmitis or siderosis were found. Only one of the patients reported here had had prompt access to appropriate ophthalmological care; one eye was NPL, while the other did not improve beyond the pre-injury acuity of CF after primary repair and optical iridectomy, due to old corneal scarring.

Of the other main causes of blindness in adults, 266 cases (59%) were due to cataract, 63 (14%) were due to glaucoma, and 53 (12%) were due to corneal scarring (Table II).

DISCUSSION

Trauma is traditionally thought not to be a major cause of bilateral blindness, either in the developed or the developing world,⁵ although it has been



Fig. 1. Eye injuries frequently occur in association with other severe injuries.

Table II. Causes of blindness in patients attending provincial hospital

Cause	Number	Percentage
Cataract	266	59
Glaucoma	63	14
Corneal scarring	53	11.5
Trauma	17	4
Other	54	11.5
Total	453	100

estimated to affect approximately half a million people worldwide;⁶ however, there are few reliable data on the prevalence.⁵ A population-based survey in Malawi of 6981 people did not report any bilateral blindness due to trauma,¹ nor did a survey of schools for the blind in Zimbabwe³ and Ethiopia.⁴ A population-based survey of 8174 people in the Gambia reported trauma to be responsible for 2% of blindness.² Monocular blindness due to trauma is more common, and has been described as one of the six major causes of unocular blindness, especially in children.⁸ A population-based survey from Nepal reported that trauma was responsible for 7.9% of blindness in one eye.⁹

The prevalence of bilateral blindness from ocular trauma in countries at war has not been reported. The incidence of ocular trauma in warfare has been estimated to be 20–50 times higher than might be expected from the ocular surface area¹⁰ and Duke-Elder estimated direct ocular injuries to be 2.0–2.5% of all modern battle casualties.¹¹ This appears to be rising as warfare has progressed from the use of simple guns and explosives to more sophisticated and powerful ordnance – from 0.65% of all casualties in the Crimean War and 0.57% in the American Civil War to 8.1% in the Korean War and 5.6–10% in the Arab–Israeli War.^{10–12}

Landmines add another dimension to this picture. They do not recognise ceasefires and they do not discriminate between civilians and soldiers, resulting in injuries which affect the civilian population of a country long after hostilities have ended. In the Cambodian civil war, both the government and the Khmer Rouge continue to rely heavily on the laying of landmines, with the Khmer Rouge knowingly placing antipersonnel mines in civilian areas to terrorise the local population and control their movement.⁷ Cambodia now has an estimated 4–10 million landmines,¹³ and the highest percentage of amputees in the world, with 1 in 236 of the population (approximately 36 000 people) estimated to be affected.⁷

Ocular trauma has been reported to be common in landmine incidents, and of the 17 patients blind due to trauma identified in this report, 14 were due to such injuries. Of 133 surviving patients with mine injuries seen at a UN hospital in the demilitarised zone between Iraq and Kuwait in autumn 1991, 27 (20%) had significant ocular injuries, of which 13



Fig. 2. Typical 'peppering' of the face in landmine blast.

(10%) were penetrating.¹⁴ Coupland and Korver¹⁵ reported that of 757 patients with injuries from antipersonnel mines treated at two ICRC (International Committee of the Red Cross) hospitals, 8% had penetrating eye injuries. Khan *et al.*¹⁶ reported 221 Afghan refugees admitted with ocular trauma to a hospital in Peshawar; 93.2% of the injuries were due to bomb or mine blast, and 172 cases involved ocular penetration, with 25 cases being bilateral. Landmine injuries are essentially blast injuries¹⁵ with multiple small high-velocity particles (usually soil and grit) causing injury. Most landmines contain mainly explosive, with only small amounts of metal and plastic (to evade mine detectors), thus making radiological identification of foreign bodies difficult.¹⁵ Fig. 2 shows a typical blast victim with 'peppering' of the face by small fragments (mainly soil and grit), showing how easily bilateral penetrating ocular injuries can occur.

The demography of those blinded by landmine blasts increases the social and economic burden for the affected population (Fig. 3). All 14 of the landmine victims reported here were male, and 13 were between the ages of 15 and 35 years (Table I). Other reports confirm that young adult males are predominately affected,^{7,16} and this does not appear to be due to them being on active military service.^{7,13} The numbers of women and children affected seem to be much smaller, possibly due to differences in the division of labour, although it is thought that many children do not survive their initial injuries and therefore do not make it to hospital.¹³

The difficulties of successful surgical treatment of eye injuries, along with the high financial cost, mean that efforts are usually aimed at the prevention of ocular trauma in both developed and developing



Fig. 3. A 23-year-old man blinded by a landmine blast.

countries. In Cambodia mines awareness training has been instituted to teach villagers (especially children) how to minimise the dangers of landmines. Mine clearance programmes continue, but it is estimated it will take 250 years to rid Cambodia of landmines at current levels of activity. In addition, mines are still being laid in Cambodia by both sides. Efforts are now being made at an international level to ban the use of landmines,¹⁷ and in December 1993 the United Nations General Assembly unanimously passed a non-binding resolution calling for a worldwide moratorium on the export of anti-personnel landmines.

CONCLUSION

This hospital-based study suggests that bilateral blindness due to trauma, in particular landmine incidents, is a significant burden in Cambodia, affecting predominantly young men. There are few ophthalmologists outside the capital Phnom Penh, and there are no facilities for posterior segment surgery, or electromagnets, in the country. Efforts must be directed towards prevention, by education, mine clearance and a cessation of the laying of antipersonnel landmines.

Key words: Ocular trauma, Blindness, Landmines, Cambodia.

REFERENCES

1. Chirambo MC, Tielsch JM, West KP, *et al.* Blindness and visual impairment in southern Malawi. *Bull WHO* 1986;64:567-72.
2. Faal H, Minassian D, Sowa S, Foster A. National survey of blindness and low vision in The Gambia: results. *Br J Ophthalmol* 1989;73:82-7.
3. Schwab L, Kagame K. Blindness in Africa: Zimbabwe schools for the blind survey. *Br J Ophthalmol* 1993;77: 410-2.
4. Wolde-Gebriel Z, Gebu H, West CE. Causes of blindness in children in the blind schools of Ethiopia. *Trop Geograph Med* 1992;44(1-2):135-41.

5. Schwab L. Blindness from trauma in developing countries. *Int Ophthalmol Clin* 1990;30:28-9.
6. Thylefors B. Epidemiological patterns of ocular trauma. *Aust NZ J Ophthalmol* 1992;20:95-8.
7. Stover E, Keller AS, Cobey J, Sam S. The medical and social consequences of landmines in Cambodia. *JAMA* 1994 272:331-6.
8. Wilson J. *World blindness and its prevention*. Oxford: Oxford University Press, 1980: 11-3.
9. Brilliant LB, Pokhrel RP, Grasset NC, *et al*. Epidemiology of blindness in Nepal. *Bull WHO* 1985;63: 375-86.
10. Triester G. Ocular casualties in the six day war. *Am J Ophthalmol* 1969;68:669-75.
11. Duke-Elder S (ed). *System of ophthalmology*, vol 14, part 1. London: Henry Kimpton, 1972:51.
12. Gombos GM. Ocular injuries in Jerusalem during the 1967 Arab-Israeli conflict. *Am J Ophthalmol* 1969;68: 474-8.
13. Davies P, Dunlop N. *War of the mines: Cambodia, landmines and the impoverishment of a nation*. Colorado, USA: Pluto Press, 1994.
14. Pillgram-Larsen J, Mellesmo S, Peck R. Injuries from mines. *Tidsskrift for Den Norske Laegeforening* 1992; 112:2183-7.
15. Coupland RM, Korver A. Injuries from antipersonnel mines: the experience of the International Committee of the Red Cross. *BMJ* 1991;303:1509-12.
16. Khan MD, Kundi N, Mohammed Z, Nazeer A, Gulab A. Ocular war trauma in Afghan refugees of Russian invasion. *Pak J Ophthalmol* 1987;3:75-8.
17. *Country Report: Afghanistan*. Second NGO Conference on Landmines. Geneva, May 1994.